

Claims

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1. A device for transdermal administration of topical therapeutic agents, comprising an applicator for applying an effective amount of a therapeutic agent to a tissue surface of a subject; and an ultrasound transducer, operatively coupled to the applicator, for providing ultrasound energy to the tissue surface at at least one predetermined frequency to promote transdermal absorption of the drug through the tissue of the subject.)
  2. The device of claim 1, wherein the ultrasound transducer further comprises at least one oscillating element capable of generating ultrasound energy at a frequency of between 20 kHz and 5 MHz.
  3. The device of claim 1, wherein the ultrasound transducer further comprises at least one oscillating element capable of generating ultrasound energy at a power of about 0.02 to about 3 watts/cm<sup>2</sup>.
  4. The device of claim 1, wherein the device further comprises a controller for varying the frequency of the ultrasound energy.
  5. The device of claim 1, wherein the device further comprises a controller for varying the power of the ultrasound energy.
  6. The device of claim 1, wherein the device further comprises a compliant skin contacting material.
  7. The device of claim 1, wherein the applicator further comprises a receptacle for drug dispensal.
  8. The device of claim 1, wherein the applicator further comprises a skin patch carrying a pre-defined dosage of the agent.
  9. The device of claim 1, wherein the applicator further comprises a condom carrying a pre-defined dosage of the agent.
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10. The device of claim 1, wherein the applicator further comprises a cap adapted for placement on a subject's head carrying a pre-defined dosage of the agent.
11. The device of claim 1, wherein the applicator further comprises a cartridge containing a pre-defined dosage of the agent.
12. The device of claim 1, wherein the applicator further comprises a dispenser cartridge with a connector for coupling the dispenser to the transducer.
13. The device of claim 1, wherein the applicator further comprises a reservoir of the agent and a flow regulator for applying a pre-defined dosage of the agent.
14. The device of claim 1, wherein the device further comprises a pressure transducer for monitoring changes in the tissue during therapy.
15. The device of claim 1, wherein the device further comprises a ring-like structure adapted to surround the tissue surface.
16. The device of claim 1, wherein the device further comprises a plurality of ultrasound transducers.
17. The device of claim 16, wherein the plurality of ultrasound transducers are arranged to provide constructive wave interference.
18. The device of claim 16, wherein the plurality of ultrasound transducers are arranged in a toroidal configuration.
19. The device of claim 1, wherein the device further comprises a detector for monitoring feedback signals from the transducer.
20. The device of claim 1, wherein the device further comprises a battery for power supply.

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21. A method for treating erectile dysfunction, the method comprising:  
contacting a tissue surface of a male subject in need of such treatment with an  
effective amount of an agent capable of treating erectile  
dysfunction; and  
applying ultrasound energy to the tissue surface, such that the erectile  
dysfunction is treated.
22. The method of claim 21, wherein the tissue surface is a skin surface of the penis.
23. The method of claim 21, wherein the step of contacting comprises applying the  
active agent to the tissue surface with a skin patch carrying the active agent.
24. The method of claim 21, wherein the step of contacting comprises applying the  
active agent to the tissue surface from a reservoir of the active agent stored  
within a hand held applicator.
25. The method of claim 21, wherein the step of contacting comprises applying the  
active agent to the tissue surface from a dispenser coupled to an ultrasound  
transducer, and the step of applying ultrasound energy further comprises  
activating the transducer.
26. The method of claim 21, wherein the step of contacting comprises applying the  
active agent to the tissue surface with a condom coated with the active agent.
27. The method of claim 21, wherein the agent capable of treating erectile  
dysfunction is selected from the group consisting of phosphodiesterase inhibitors,  
vasoactive agents, papaverine, minoxidil, prostaglandins, organic nitrites,  
inhibitors of the renin-angiotensin system, and inducible Nitric Oxide Synthase  
(iNOS) agents.
28. The method of claim 27, wherein the phosphodiesterase inhibitor is sildenafil.
29. The method of claim 27, wherein the phosphodiesterase inhibitor is alprostadil.

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30. The method of claim 21, wherein the step of applying ultrasound energy comprises applying ultrasound energy at a frequency ranging from about 20 kHz to about 5 MHz and at a power of about 0.02 to about 3 watts/cm<sup>2</sup>.
31. A method for treating muscle inflammation, the method comprising:  
contacting a tissue surface overlying an inflamed muscle region with an effective amount of an agent capable of treating muscle inflammation; and  
applying ultrasound energy to the tissue surface, such that the agent is transported transdermally to the muscle tissue and the inflammation is treated.
32. The method of claim 31, wherein the step of contacting comprises applying the active agent to the tissue surface with a skin patch carrying the active agent.
33. The method of claim 31, wherein the step of contacting comprises applying the active agent to the tissue surface from a reservoir of the active agent stored within a hand held applicator.
34. The method of claim 31, wherein the step of contacting comprises applying the active agent to the tissue surface from a dispenser coupled to an ultrasound transducer, and the step of applying ultrasound energy further comprises activating the transducer.
35. The method of claim 31, wherein the agent capable of treating muscle inflammation is selected from the group consisting of analgesics, anti-inflammatory agents, and steroids.
36. The method of claim 31, wherein the agent is a cortisone derivative.
37. The method of claim 31, wherein the step of applying ultrasound energy further comprises applying ultrasound energy at a frequency ranging from about 20 kHz to about 5 MHz.
38. The method of claim 31, wherein the step of applying ultrasound energy further comprises applying ultrasound energy at a power of about 0.02 to about 2 watts/cm<sup>2</sup>.

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39. The method of claim 31, wherein the step of applying ultrasound energy further comprises applying ultrasound energy with a plurality of ultrasound transducers arranged to provide constructive wave interference.
40. The method of claim 31, wherein the step of applying ultrasound energy further comprises applying ultrasound energy and varying the frequency of ultrasonic oscillations during the application.
41. A method for treating hair loss comprising:  
contacting a tissue surface of a subject in need of such treatment with an effective amount of an agent capable of inhibiting hair loss; and  
applying ultrasound energy to the tissue surface, such that the agent is transported transdermally to a subdermal region proximal to a dormant hair follicle papilla stimulate activity of the dormant papilla.
42. The method of claim 41, wherein the tissue surface is the scalp.
43. The method of claim 41, wherein the step of contacting comprises applying the active agent to the tissue surface with a cap coated with the active agent.
44. The method of claim 41, wherein the step of contacting comprises applying the active agent to the tissue surface from a reservoir of the active agent stored within a hand held applicator.
45. The method of claim 41, wherein the step of contacting comprises applying the active agent to the tissue surface from a dispenser coupled to an ultrasound transducer, and the step of applying ultrasound energy further comprises activating the transducer.
46. The method of claim 41, wherein the agent capable of treating muscle inflammation is selected from the group consisting of minoxidil, finasteride, fabao-101, cyproterone acetate, ethinyl estradiol, aldactone and spironolactone.
47. The method of claim 41, wherein the agent is minoxidil derivative.

48. The method of claim 41, wherein the step of applying ultrasound energy further comprises applying ultrasound energy at a frequency ranging from about 20 kHz to about 5 MHz and at a power of about 0.02 to about 2 watts/cm<sup>2</sup>.
49. The method of claim 41, wherein the step of applying ultrasound energy further comprises applying ultrasound energy with a plurality of ultrasound transducers arranged to provide constructive wave interference.
50. The method of claim 41, wherein the step of applying ultrasound energy further comprises applying ultrasound energy and varying the frequency of ultrasonic oscillations during the application.

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